Collision tectonics of the northern Izu-Bonin arc around 15 Ma and possibility of existence of the Mineoka plate

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The collision of the Izu-Bonin Arc with the Honshu Arc initiated at around 16 Ma and first peaked at about 15 Ma, based on the onset of interstratification of terrigenous turbidite in the Koma Terrane and the initial deposition of the Kanto Syntaxis formation revealed by paleomagnetic data. The preservation of terrigenous turbidites of about 16 Ma and about 15-14 Ma in the Koma Terrane alongside contemporaneous volcanic-volcaniclastic strata in the accretionary terrane suggests that the subducted portion of the Philippine Sea plate was very small during the peak collision period in the Izu Collision Zone. Plunge of the Koma Terrane into the Honshu Arc would have only been partially complete (as compared to today), because the sinistral strike-slip structure of the eastern Akaishi Mountains is inferred to be accomplished before the intrusion of the ~15 Ma Kaikoma Granitic Body. The Misaka Terrane, adjacent to the Kobotoke Belt of the Kanto Mountains, was beginning to receive a supply of terrigenous turbidite by about 13 Ma, and the intrusion age of the Ashigawa-Tokuwa Granitic Bodies, which intersect the suture line, is supposed to be 13-12 Ma. Accordingly, this terrane had been emplaced at the relative position of the Kobotoke Belt by that time. In the Tanzawa Terrane the terrigenous turbidite supply was lacking until 8 Ma, however seafloor erosion was predominant in the peripheral area till that time.

In the light of the transition of volcanic activities in the Hokuetsu region at about 2 Ma, the leading edge of the Philippine Sea plate slab subducting underneath the Kanto region is expected to be situated aseismically beneath the Takada plain, Niigata, preceding the known seismic slab. The margin of the slab drawn here can be regarded as the trench-side margin of the Izu-Bonin forearc before its subduction. Pulling out the slab to the projected location at 15 Ma accomplishes a reconstruction of the southernmost reach of the Izu-Bonin Arc, southward of the Kobotoke Belt and outboard of the contemporaneous subduction boundary of the eastern part of Southwest Japan. The leading edge of the Philippine Sea plate slab beneath Southwest Japan is considered to have extended beneath the southern coast of the Setonai Sea at ~15 Ma, based on the timing of initiation of Setouchi Volcanism. Consequently, the edge probably extended toward the Izu Collision Zone with a trend of about N80E. This configuration is consistent with the history of deposition of terrigenous turbidite in the Misaka and Tanzawa Terranes, and that of the Miura Group in the Boso-Miura Peninsulas. This requires, however, that the Koma to Tanzawa Terranes must be situated fairly close to the trench. In the Tanzawa and Misaka Terranes before and after 15 Ma, depleted island arc tholeiites and backarc basin basalt type volcanism predominated (note that high-Mg type calc-alkali volcanism was predominant during 17-16 Ma), the volcanism in these terranes was different from so-called forearc volcanism.

In order to solve this difficulty, another plate located between the northern tip of the Izu-Bonin arc and Southwest Japan is assumed. In this plate tectonic regime, the Pacific plate subducts underneath the assumed plate at first, and then generates the volcanism of the Koma to Tanzawa Terranes, when it reaches beneath the volcanic front of the Izu-Bonin arc. To take such a hypothetical lost plate, it can be also explained reasonably that the Takakusayama, Komayama, Hayama and Mineoka Groups, with many non-arc volcanic rock suites, are distributed along the suture line of the Izu-Bonin and the Honshu arcs. This lost plate would correspond to the so-called Mineoka plate.